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FLOOD INSURANCE STUDY

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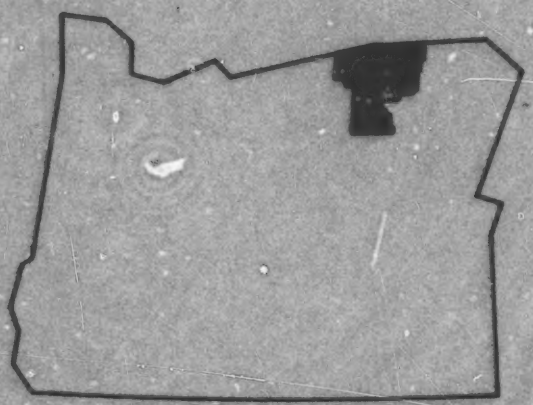
CITY OF HERMISTON, OREGON
UMATILLA COUNTY



SEPTEMBER 29, 1986

Federal Emergency Management Agency

COMMUNITY NUMBER - 410209

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FLOOD INSURANCE STUDY

1.0 INTRODUCTION

1.1 Purpose of Study

This Flood Insurance Study investigates the existence and severity of flood hazards in the City of Hermiston, Umatilla County, Oregon, and aids in the administration of the National Flood Insurance Act of 1968 and the Flood Disaster Protection Act of 1973. This study will be used to convert the City of Hermiston to the regular phase of the National Flood Insurance Program (NFIP). Local and regional planners will use this study in their efforts to promote sound flood plain management.

This Flood Insurance Study was prepared by compiling existing hydrologic and hydraulic technical and scientific data. The data were identified as the best available at the time of compilation of this Flood Insurance Study and should depict the general conditions of the flooding sources with relative accuracy. FEMA performed a cursory review and accepted the data as valid for purposes of this Flood Insurance Study and the NFIP. However, if better information is known to exist or has been developed since the date of this report, the information should be immediately forwarded to the address below for consideration for revision of this study.

> Natural and Technological Hazards Division, FEMA, Federal Regional Center, 130 228th Street, SW, Bothell, Washington 98021-9796

In some states or communities, flood plain management criteria or regulations may exist that are more restrictive or comprehensive than the minimum Federal requirements. In such cases, the more restrictive criteria take precedence and the State (or other jurisdictional agency) will be able to explain them.

1.2 Authority and Acknowledgments

The sources of authority for this Flood Insurance Study are the National Flood Insurance Act of 1968 and the Flood Disaster Protection Act of 1973.

The hydrologic and hydraulic analyses for this study were performed by the U.S. Army Corp of Engineers (COE), as reported in the Flood Insurance Study for the unincorporated areas of Umatilla County, Oregon (Reference 1).

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1.3 Coordination

In August 1985, the Federal Emergency Management Agency (FEMA) requested that a Flood Insurance Study for the City of Hermiston, Oregon, be prepared using existing data generated for the revised Flood Insurance Study for Umatilla County (Reference 1).

Preparation of the Umatilla County study was coordinated with the Oregon Water Resources Department, FEMA, and Umatilla County.

The final community coordination meeting was held on November 22, 1985, and attended by representatives of FEMA, the study contractor, and the community. All problems raised at that meeting have been addressed in this study.

2.0 AREA STUDIED

2.1 Scope of Study

This Flood Insurance Study covers the incorporated areas of the City of Hermiston, Umatilla County, Oregon. The area of study is shown on the Vicinity Map (Figure 1).

The Umatilla River was studied in detail from approximately 4.4 to 33.4 miles above its mouth. Two areas of Hermiston that lie along the Umatilla River were studied in detail.

The areas studied by detailed methods were selected based on the extent and validity of available hydrologic and hydraulic data.

2.2 Community Description

The City of Hermiston is located in the northwestern corner of Umatilla County, approximately 35 miles northwest of Pendleton. Umatilla County is located in the northeastern corner of Oregon, bordering Washington.

According to the U.S. Bureau of the Census, the population of Hermiston grew from 4,893 to 9,408 from 1970 to 1980 (Reference 2).

The Umatilla River, a tributary of the Columbia River, flows westerly within the county to Nolin, then flows northwesterly to Cottonwood Bend. From there, the flow is generally north to its confluence with the Columbia River.

The Umatilla River flood plain is devoted largely to agriculture. Development along the flood plain in Hermiston is minimal.

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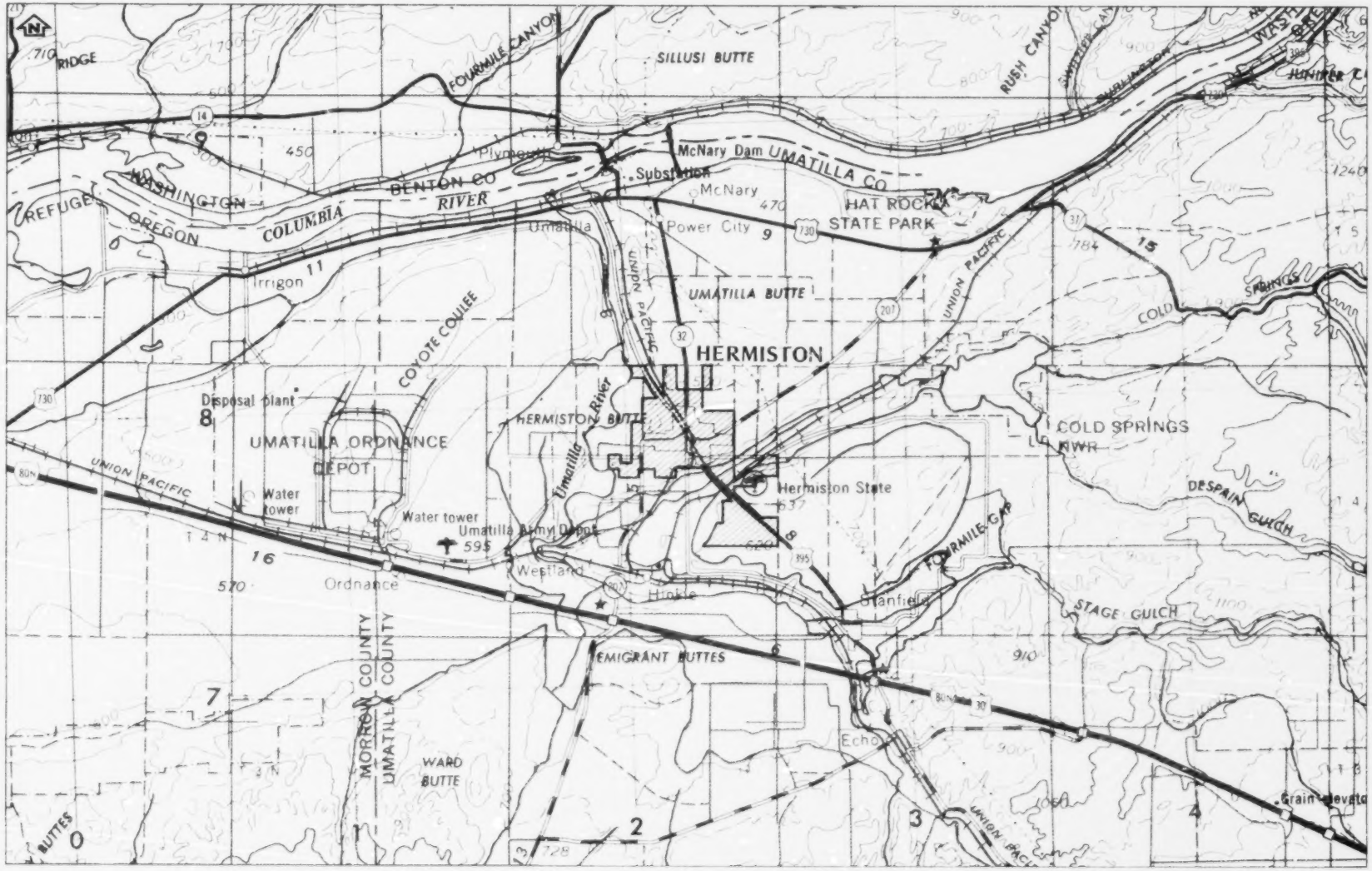

FIGURE 1

FEDERAL EMERGENCY MANAGEMENT AGENCY

CITY OF HERMISTON, OR
(UMATILLA CO.)

APPROXIMATE SCALE

3 0 3 6 9 MILES

VICINITY MAP

The topography of the area around Hermiston is generally high, rolling prairies.

The climate of the Umatilla River basin is characterized by light to moderate precipitation and a wide range in temperature. In general, the climate is subject to the moderating influence of the prevailing westerly flow of maritime air from the Pacific Ocean, but occasional influxes of polar airmasses cause brief periods of extremely cold temperatures. Record extreme temperatures within the county are 119°F at Pendleton and -52°F at Meacham.

The seasonal distribution of precipitation is similar to that generally observed over the interior of the Pacific Northwest, with the greater portion falling during the winter. The average annual precipitation at Pendleton is 13.6 inches. Nearly 60 percent of the annual precipitation is recorded during November through March.

2.3 Principal Flood Problems

High flows on the Umatilla River generally begin in February and last through June. The prevailing summer low flows are somewhat increased during the late fall and early winter by rainfall and melting of low-elevation snow. November, December, and January often have brief periods of high flows from heavy rain, along with melting snow caused by unseasonably warm temperatures. When snowmelt augments rainfall runoff, the floods have both high peaks and large volumes; damaging stages seldom last longer than 1 or 2 days.

Damaging floods have occurred in the study area of the Umatilla River in 1882, 1906, 1908, 1913, 1921, 1931, 1932, 1937, 1946, 1949, 1958, and 1965. Of these, the December 1882 flood was the highest of record.

2.4 Flood Protection Measures

There are no flood protection structures along the Umatilla River within Hermiston.

Flood forecasts are made for the Umatilla River and tributaries by the Office of the National Weather Service, River District, in Portland, Oregon. Forecasts are issued to the State and County Civil Defense Directors and are disseminated in the area by the National Weather Service in Pendleton.

3.0 ENGINEERING METHODS

For the flooding sources studied in detail in the community, standard hydrologic and hydraulic study methods were used to determine the flood

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hazard data required for this study. Flood events of a magnitude which are expected to be equaled or exceeded once on the average during any 10-, 50-, 100-, or 500-year period (recurrence interval) have been selected as having special significance for flood plain management and for flood insurance rates. These events, commonly termed the 10-, 50-, 100-, and 500-year floods, have a 10, 2, 1, and 0.2 percent chance, respectively, of being equaled or exceeded during any year. Although the recurrence interval represents the long-term average period between floods of a specific magnitude, rare floods could occur at short intervals or even within the same year. The risk of experiencing a rare flood increases when periods greater than 1 year are considered. For example, the risk of having a flood which equals or exceeds the 100-year flood (1 percent chance of annual exceedence) in any 50-year period is approximately 40 percent (4 in 10), and, for any 90-year period, the risk increases to approximately 60 percent (6 in 10). The analyses reported herein reflect flooding potentials based on conditions existing in the community at the time of completion of this study. Maps and flood elevations will be amended periodically to reflect future changes.

3.1 Hydrologic Analyses

Hydrologic analyses were carried out to establish the peak discharge-frequency relationships for each flooding source studied in detail affecting the community.

A gaging station on the Umatilla River, located approximately 2.1 miles upstream from the confluence with the Columbia River, was the principal source of data for defining discharge-frequency relationships for the river downstream from Westland Bridge near Hermiston. The gage has been operated since 1904. Values of the 10-, 50-, 100-, and 500-year peak discharges were obtained from a log-Pearson Type III distribution of annual peak-flow data.

A gaging station on the Umatilla River located 0.5 mile northeast of Yoakum, Oregon, was the principal source of data for defining discharge-frequency relationships for the river upstream of the Westland Bridge near Hermiston. The gage has been operated since 1903. Values of the 10-, 50-, 100-, and 500-year peak discharges were obtained by a drainage-area ratio of the specific discharge frequencies at the Yoakum gage.

Peak discharge-drainage area relationships for the Umatilla River are shown in Table 1.

3.2 Hydraulic Analyses

Analyses of the hydraulic characteristics of flooding from the sources studied were carried out to provide estimates of the elevations of floods of the selected recurrence intervals.

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Table 1. Summary of Discharges

Flooding Source and Location	Drainage Area (Square Miles)	Peak Discharges (Cubic Feet per Second) 10-Year	50-Year	100-Year	500-Year
Umatilla River					
At Umatilla, Oregon	2,290	10,800[1]	17,800[1]	21,600[1]	31,900[1]
At Buttercreek	2,250	14,000	22,500	28,000	43,000

[1]Discharges for this Drainage Area Reflect a Reduction in Discharge by Temporary Valley Storage on the Umatilla River Below the Yoakum Gage.

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Water-surface elevations of floods of the selected recurrence intervals were computed through use of the COE HEC-2 step-backwater computer program (Reference 3). Flood profiles were drawn showing computed water-surface elevations for floods of the selected recurrence intervals.

Cross sections for backwater analysis of the streams in the study area were obtained from aerial photographs (Reference 4). The below-water sections were obtained by field measurement. All bridges, dams, and culverts were field checked to obtain elevation data and structural geometry.

Locations of selected cross sections used in the hydraulic analyses are shown on the Flood Profiles (Exhibit 1). For stream segments for which a floodway was computed (Section 4.2), selected cross section locations are also shown on the Flood Insurance Rate Map (Exhibit 2).

Channel roughness factors (Manning's "n") used in the hydraulic computations were chosen by engineering judgment and based on field observations of the streams and flood plain areas. Roughness values for the main channel of the Umatilla River ranged from 0.035 to 0.038; overbank roughness values ranged from 0.040 to 0.080 for all floods.

Starting water-surface elevations for the Umatilla River were calculated using the slope-area method.

The hydraulic analyses for this study were based on unobstructed flow. The flood elevations shown on the profiles are thus considered valid only if hydraulic structures remain unobstructed, operate properly, and do not fail.

All elevations are referenced to the National Geodetic Vertical Datum of 1929 (NGVD). Elevation reference marks used in this study are shown on the maps; the descriptions of the marks are presented in Elevation Reference Marks (Exhibit 3).

4.0 FLOOD PLAIN MANAGEMENT APPLICATIONS

The NFIP encourages State and local governments to adopt sound flood plain management programs. Therefore, each Flood Insurance Study provides 100-year flood elevations and delineations of the 100- and 500-year flood plain boundaries and 100-year floodway to assist communities in developing flood plain management measures.

4.1 Flood Boundaries

To provide a national standard without regional discrimination, the 1 percent annual chance (100-year) flood has been adopted by

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FEMA as the base flood for flood plain management purposes. The 0.2 percent annual chance (500-year) flood is employed to indicate additional areas of flood risk in the community. For each stream studied in detail, the 100- and 500-year flood plain boundaries have been delineated using the flood elevations determined at each cross section. Between cross sections, the boundaries were interpolated using topographic maps developed from aerial photographs at scales of 1:3,600, 1:4,800, 1:6,000, and 1:12,000 (Reference 4).

The 100- and 500-year flood plain boundaries are shown on the Flood Insurance Rate Map (Exhibit 2). On this map, the 100-year flood plain boundary corresponds to the boundary of the areas of special flood hazards (Zone AE), and the 500-year flood plain boundary corresponds to the boundary of areas of moderate flood hazards. In cases where the 100- and 500-year flood plain boundaries are close together, only the 100-year flood plain boundary has been shown. Small areas within the flood plain boundaries may lie above the flood elevations but cannot be shown due to limitations of the map scale and/or lack of detailed topographic data.

4.2 Floodways

Encroachment on flood plains, such as structures and fill, reduces flood-carrying capacity, increases flood heights and velocities, and increases flood hazards in areas beyond the encroachment itself. One aspect of flood plain management involves balancing the economic gain from flood plain development against the resulting increase in flood hazard. For purposes of the NFIP, a floodway is used as a tool to assist local communities in this aspect of flood plain management. Under this concept, the area of the 100-year flood plain is divided into a floodway and a floodway fringe. The floodway is the channel of a stream, plus any adjacent flood plain areas, that must be kept free of encroachment so that the 100-year flood can be carried without substantial increases in flood heights. Minimum Federal standards limit such increases to 1.0 foot, provided that hazardous velocities are not produced. The floodways in this study are presented to local agencies as minimum standards that can be adopted directly or that can be used as a basis for additional floodway studies.

The floodways presented in this study were computed for certain stream segments on the basis of equal conveyance reduction from each side of the flood plain. Floodway widths were computed at cross sections. Between cross sections, the floodway boundaries were interpolated. The results of the floodway computations are tabulated for selected cross sections (Table 2). The computed floodways are shown on the Flood Insurance Rate Map (Exhibit 2). In cases where the floodway and 100-year flood plain boundaries are either close together or collinear, only the floodway boundary is shown.

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FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER SURFACE ELEVATION			
CROSS SECTION	DISTANCE[1]	WIDTH[2] (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
					(FEET NGVD)			
Umatilla River A	26,512	453/70	4,413	4.9	417.9	417.9	418.9	1.0

[1]Feet Above Mouth [2]Width/Width Within Corporate Limits

TABLE 2

FEDERAL EMERGENCY MANAGEMENT AGENCY

CITY OF HERMISTON, OR
(UMATILLA CO.)

FLOODWAY DATA

UMATILLA RIVER

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The area between the floodway and 100-year flood plain boundaries is termed the floodway fringe. The floodway fringe encompasses the portion of the flood plain that could be completely obstructed without increasing the water-surface elevation of the 100-year flood by more than 1.0 foot at any point. Typical relationships between the floodway and the floodway fringe and their significance to flood plain development are shown in Figure 2.

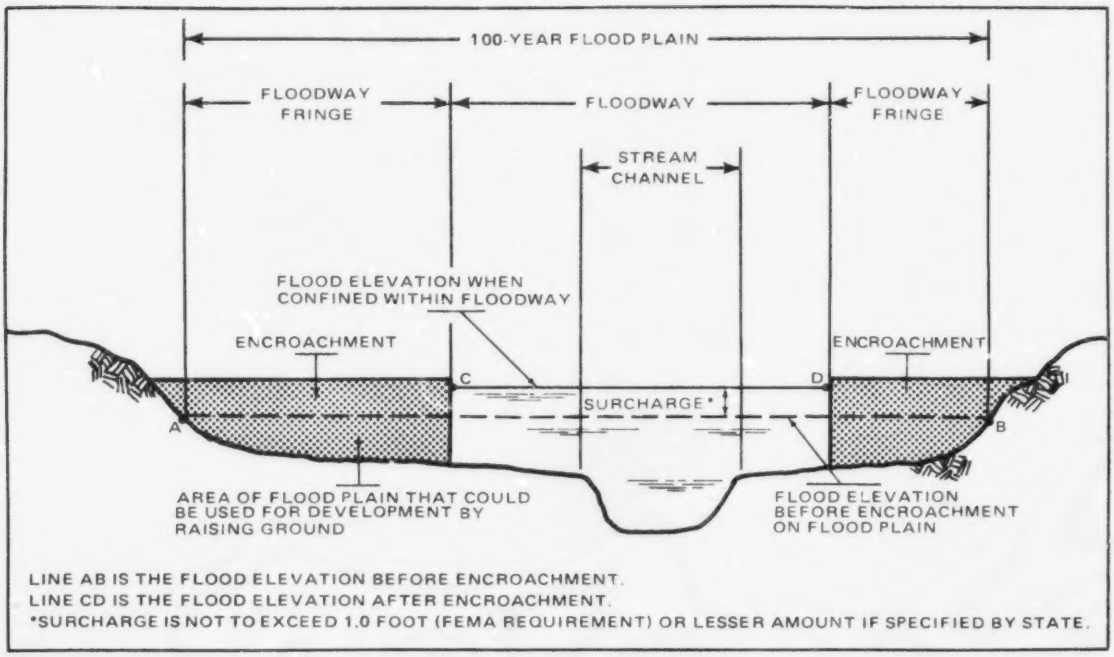
100-YEAR FLOOD PLAIN
FLOODWAY FRINGE
FLOODWAY
FLOODWAY FRINGE
STREAM CHANNEL
FLOOD ELEVATION WHEN CONFINED WITHIN FLOODWAY
ENCROACHMENT
ENCROACHMENT
C
D
SURCHARGE*
A
B
AREA OF FLOOD PLAIN THAT COULD BE USED FOR DEVELOPMENT BY RAISING GROUND
FLOOD ELEVATION BEFORE ENCROACHMENT ON FLOOD PLAIN
LINE AB IS THE FLOOD ELEVATION BEFORE ENCROACHMENT.
LINE CD IS THE FLOOD ELEVATION AFTER ENCROACHMENT.
*SURCHARGE IS NOT TO EXCEED 1.0 FOOT (FEMA REQUIREMENT) OR LESSER AMOUNT IF SPECIFIED BY STATE.

Figure 2. Floodway Schematic

5.0 INSURANCE APPLICATION

For flood insurance rating purposes, flood insurance zone designations are assigned to a community based on the results of the engineering analyses. These zones are as follows:

Zone AE

Zone AE is the flood insurance rate zone that corresponds to the 100-year flood plains that are determined in the Flood Insurance Study by detailed methods. Whole-foot base flood elevations derived from the detailed hydraulic analyses are shown at selected intervals within this zone.

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Zone X

Zone X is the flood insurance rate zone that corresponds to areas outside the 500-year flood plain, areas within the 500-year flood plain, areas of 100-year flooding where average depths are less than 1 foot, areas of 100-year flooding where the contributing drainage area is less than 1 square mile, and areas protected from the 100-year flood by levees. No base flood elevations or depths are shown within this zone.

6.0 FLOOD INSURANCE RATE MAP

The Flood Insurance Rate Map is designed for flood insurance and flood plain management applications.

For flood insurance applications, the map designates flood insurance rate zones as described in Section 5.0 and, in the 100-year flood plains that were studied by detailed methods, shows selected whole-foot base flood elevations or average depths. Insurance agents use the zones and base flood elevations in conjunction with information on structures and their contents to assign premium rates for flood insurance policies.

For flood plain management applications, the map shows by tints, screens, and symbols the 100- and 500-year flood plains, the floodways, and the locations of selected cross sections used in the hydraulic analyses and floodway computations.

7.0 OTHER STUDIES

This study agrees with the revised Umatilla County Flood Insurance Study (Reference 1).

8.0 LOCATION OF DATA

Information concerning the pertinent data used in the preparation of this study can be obtained by contacting the Natural and Technological Hazards Division, FEMA, Federal Regional Center, 130 228th Street, SW, Bothell, Washington 98021-9796.

9.0 BIBLIOGRAPHY AND REFERENCES

1. Federal Emergency Management Agency, Type 19 Flood Insurance Study, Umatilla County, Oregon (Unincorporated Areas), unpublished

2. U.S. Department of Commerce, Bureau of the Census, 1980 Census of Population, Number of Inhabitants, Oregon

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3. U.S. Department of the Army, Corps of Engineers, Hydrologic Engineering Center, HEC-2 Water-Surface Profiles, Generalized Computer Program, Davis, California, November 1976, revised April 1980

4. U.S. Department of the Army, Corps of Engineers, Walla Walla District, Aerial Photographs, Umatilla County, Oregon, Scales 1:3,600, 1:4,800, 1:6,000, and 1:12,000, May 1970, June 1971, June 1972, May 1973, and August 1974

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Exhibit 3 - Elevation Reference Marks

REFERENCE MARK	FIRM PANEL	ELEVATION (FEET NGVD)	DESCRIPTION OF LOCATION
RM1	0005	456.636	A standard disk stamped "B114 1934," near the intersection of the main Union Pacific Railroad track and U.S. Route 30, 287.7 feet north of the track centerline, 4.2 feet north of the southeast corner of the section house fence. Established by the U.S. Coast and Geodetic Survey.

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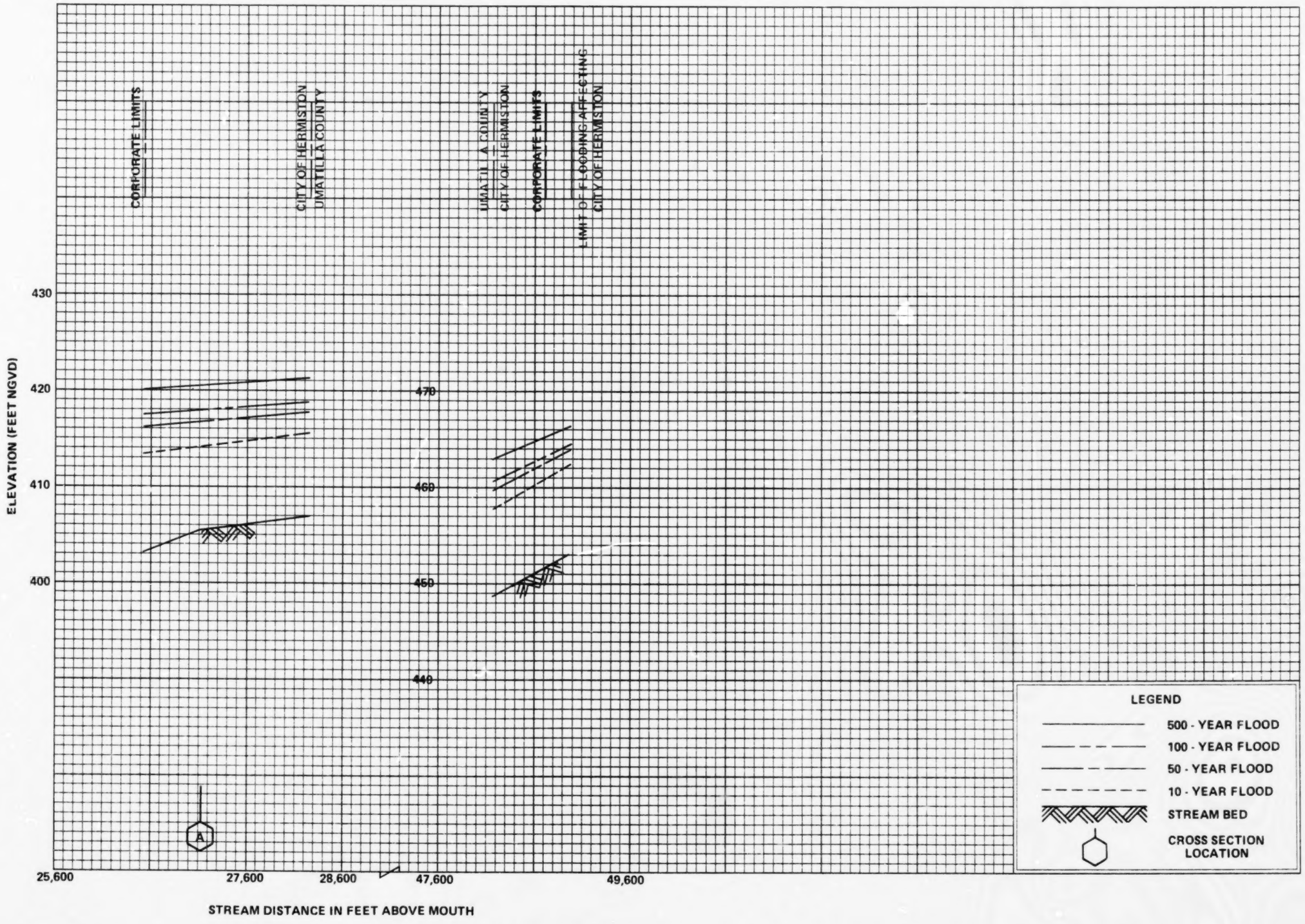

FLOOD PROFILES

UMATILLA RIVER

FEDERAL EMERGENCY MANAGEMENT AGENCY

CITY OF HERMISTON, OR
(UMATILLA CO.)

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